SOME OBSERVATIONS OF THE GENUS CENTRUROIDES MARX (BUTHIDAE, SCORPIONIDA) AND C. SCULPTURATUS EWING[1]

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Since some individuals apparently are still in doubt about the status of the designation *Centruroides* vs *Centrurus* the following quotation from Pocock (1902) is given:[3]

"The name *Centrurus*, which, since 1876, has been applied by common consent to a well-known American genus of Buthidae, was originally projected into the literature in 1828 by Hemprich and Ehrenberg as a *nomen nudum*, no species being cited as referable to it (Symb. Phys. Scorpiones, 1828; Verh. nat. Fr. Berlin, 1829, p. 350; Ferussac, Bull. Sci. Nat. xviii, p. 304, 1829). It is true that Ehrenberg appears to have labelled certain specimens in the Berlin Museum with the name *Centrurus*; but this action does not establish its right to recognition. The first author to introduce the name in the orthodox and accepted fashion into systematic zoology was C. Koch, who, in 1838 (Die Arachn. iv, p. 110), assigned it to a scorpion described as *Centrurus galbineus*, which was alleged by Karsch to be based upon the young of a species belonging to a genus inhabiting the Oriental Region and afterwards named *Palamneus* by Thorell. Gervais rightly accepted Koch's application of the name *Centrurus*. Peters, on the contrary, finding Ehrenberg's labelled specimens, used *Centrurus* for the species exemplified by them, discarding *Isometrus* as a synonym, in spite of its far greater claims for admittance. If C. Koch had not previously taken up the name *Centrurus* Peters application of it might have been accepted, and strong reasons could have been advanced for following Thorell when, in 1876, he used *Centrurus* in a *restricted* sense for the genus diagnosed by himself and typified by *Scorpio gracilis* of Latr. (=*biaculeatus*, Luc.). But since the name had no recognized status until Koch introduced it, I see no escape from the conclusion that it must date from 1838

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[3]Because of the nature of this paper a complete synonymy for the genus *Centruroides* is deliberately omitted.

and be regarded as assignable to the genus typified by the species described by Koch as *Centrurus galbineus.*

"For the genus *Centrurus,* as diagnosed by Thorell, I adopt the name *Centruroides,* which, although without a diagnosis, was given by Marx (1889, Proc. U. S. Natl. Mus., 13:211) to one of the species, namely *C. exilicauda,* Wood. This species, therefore, is the type of the genus in question. It has not been described since 1863, and its generic position was unknown to Kraepelin when preparing his monograph of the scorpions in the 'Tierreich,' in spite of Marx's publication on the subject."

Furthermore, H & E's original reference associated the name *Centrurus* with scorpions having 10 eyes; *Centruroides* have eight eyes.

Mello-Leitao (1945) gives *Scorpio margaritatus* Gervais 1841 as the type of the genus. From the above it is obvious that this could not be correct since the genus *Centrurus* used by Gervais was a *nomen nudum.*

Centruroides is distinguished from the closely related genus *Rhopalurus* as follows:[4]

	Rhopalurus	Centruroides
1.	Cauda of male broader distally, equal or slightly longer than female	Cauda of male not broader distally and much longer than female
2.	Sternite III of basilary area distinctly granular	Sternite III of basilary area smooth or at most weakly granular
3.	Dorsal furrow of caudal segment V deep	Dorsal furrow of caudal segment V shallow or absent
4.	Ratio between distances of trichobothria D_2 to D_3 and D_1 to D_3 not less than 0.80	Ratio between distances of trichobothria D_2 to D_3 and D_1 to D_3 not over 0.65
5.	Center of distribution Northern South America	Center of distribution Mexico

The genus *Centruroides* is entirely an American taxon with, apparently, its center of distribution in Mexico. It is found from Central United States to Central America and in the West Indies. A few species have invaded South America as far as Argentina and Chile. The venom of some members of this genus is among the most toxic of all scorpions and has been responsible for many human deaths. *Centruroides* scorpions seek moisture and coolness, are cryptozoic and

[4]All nomenclature and mensuration according to Stahnke, Entomological News, Vol. 81, No. 12, 1970.

generally are negatively geotropic. Although apparently equipped morphologically like other scorpions they seem to have lost the ability to burrow. They are found in and around human dwellings more than scorpions of other North American genera. When kept in a container they congregate together in heaps.

In addition to the morphological characteristics listed above, the pedipalp tarsus of *Centruroides* scorpions do not have more than nine distinct non-imbricated, oblique median granular rows plus a short apical row and with or without a compound non-oblique basal row. These rows are flanked externally and internally by large, dentate granules, in between which are found one to four small granules, known as supernumerary granules. These supernumerary granules, however, do not appear until about the fourth instar. Thus juveniles of the larger species, like *C. gracilis* (Latr.), might be mistaken for an *Isometrus* species, if just this characteristic is used to identify the genus.

Centruroides scorpions lack tibial spurs but have well developed interior and exterior pedal spurs; the latter generally have a small basal thorn and macrochaete. The inferior margin of the fixed cheli-

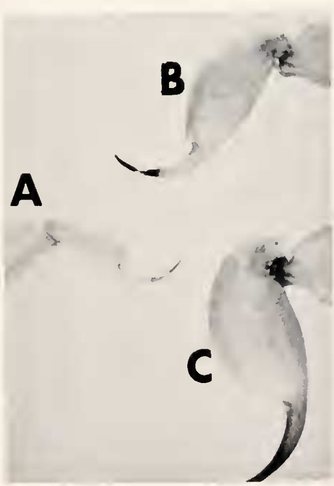


FIG. 1. Telsons of *C. sculpturatus*: A. 2nd instar; B. 5th instar; C. Adult.

FIG. 2. A concolorous *C. sculpturatus* female with a mixed litter.

ceral finger bears one large tooth while that of the movable finger bears two large teeth. The terga are mono-keeled.

In the genus *Centruroides* the subaculear protuberance is an undesirable taxonomic characteristic (Fig. 1). For example, C. exilicauda has frequently been characterized by the absence of this structure. Actually the early instars have an excellent subaculear tooth and a small subaculear tubercle may persist on the adult.

Color or color patterns have been given too much systematic importance. Hoffmann (1932) carried this to an extreme in his key to the species of the *Centruroides* of Mexico when he used as his first dichotomy:

1. "Species "non-striped", that is to say, divested of longitudinal yellow and dark lines on the dorsal plates of the abdomen.
2. "Striped" species, those which have the afore-stated stripings."

Apparently by this procedure artificial species have been created.

There is good evidence now that the so-called "striped" and "non-striped" species are merely different color-pattern phases of the same species. Thus preliminary evidence indicates that *C. vittatus* (Say), *C. pantheriensis* Stahnke, and *C. chisosarius* Gertsch are one species. Data now in our possession indicate that *C. exilicauda* has at least three color phases and that possibly the *Centruroides* of Baja merely represent color phases of one species. The discussion to follow will give evidence that *C. sculpturatus* and *C. gertschi* are various color phases of the same species.

Centruroides sculpturatus Ewing 1928

C. sculpturatus 1828. Ewing, Proc. United States Natl. Mus. 72:20.
1939. Stahnke, Doctoral Dissertation, Iowa State College, Ames, Iowa.
1940. Stahnke, Iowa State College J. Sci., 15, (1): 101.
1967. Williams & Hadley, Proc. California Acad. Sci., Ser. 4, 35 (5): 106-7. (doubtful)
C. gertschi 1940. Stahnke, Iowa State College J. Sci. 15 (1): 101.

After examining a large number of specimens of the taxon designated as *C. gertschi* Stahnke, the writer, was impressed with the great variability of the fuscous coloration. This condition raised some doubt as to the validity of the species.

Several comparative studies of the venom of *C. gertschi* and *C. sculpturatus* were made. The first, by Potter and Northey (1962), was of a serological nature. They reported the number of precipitating fractions observed for the venoms of eight scorpion species in

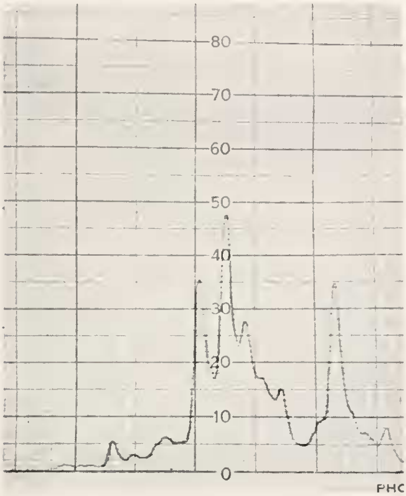


FIG. 3. *C. gertschi* venom.

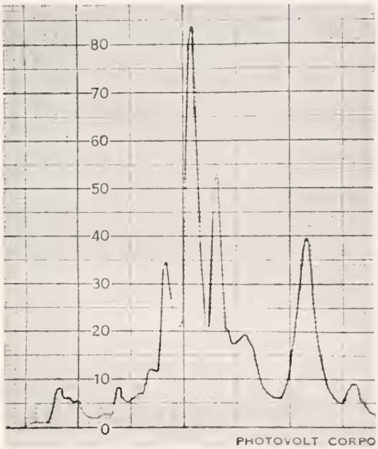


FIG. 4. *C. sculpturatus* venom.

heterologous and homologous antivenom systems. The *C. sculpturatus* homologous venom-antivenom system produced eight bands while *C. gertschi* produced seven. In the heterologous systems both produced seven bands. The evidence was not adequate on which to make a decision. The second study was an electrophoretic comparison of the two venoms. Pherograms, previously unpublished, are shown in Fig. 3 and 4. Again the evidence was inadequate. Since venom is a secretion, the differences—largely quantitative—could or could not be due to genetic factors.

Our third approach investigated the possibilities of natural hybridization. Gravid females were collected from a mixed population and housed individually in the laboratory. This gave positive results. Litters were produced containing both concolorous and patterned individuals (Fig. 2). Concolorous females produced either mixed litters or litters containing only patterned individuals. A study of second instar young revealed four rather definite color phases (Fig. 5).

Using the above as a guide, large numbers of adults were examined and the same color phases were recognizable (Fig. 6, 7 and 8).

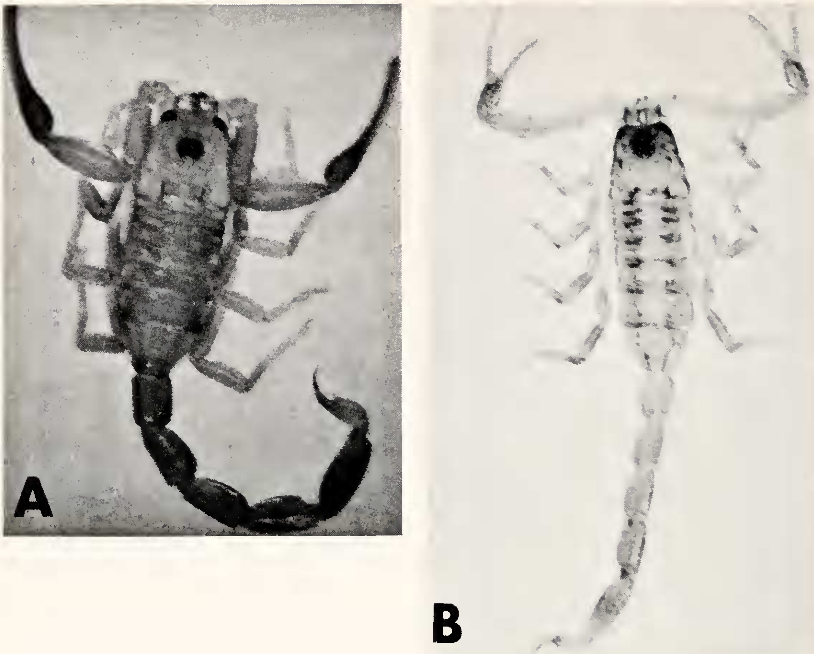
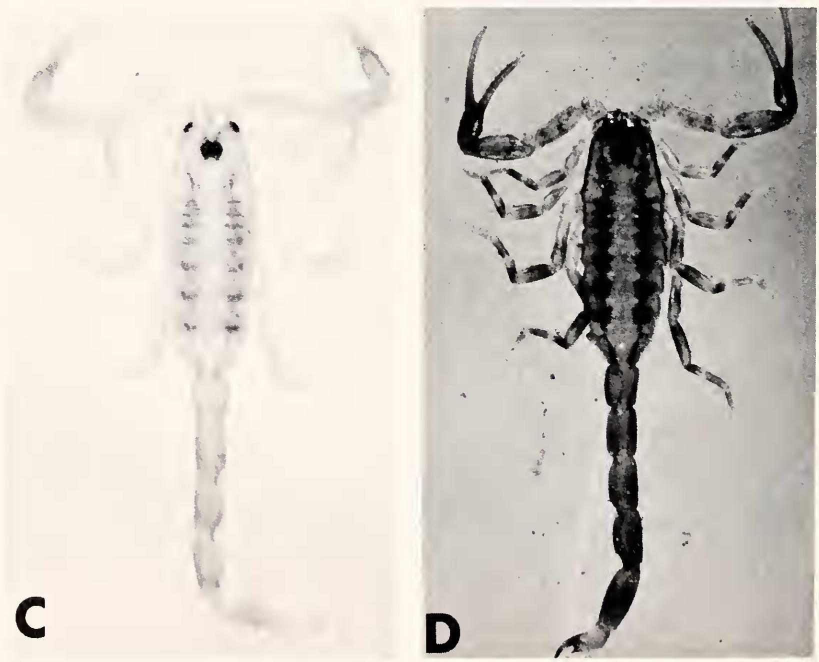


FIG. 5. Second instars of concolorous female *C. sculpturatus* showing four color patterns. Fig. 5A, phase no. 1; Fig. 5 B, phase no. 2; Fig. 5C, phase no. 3; Fig. 5D, phase no. 4.



By observing the secondary sexual characteristics of the genital region of the adults (Fig. 9) we were able to sex the second instar young. These morphological structures plus the usual sexual difference in the number of pectinal teeth made the correct sexing possible. Thus through observing the second instar young and the adults it was obvious that the color patterns were not sex associated.

FIG. 6. *C. sculpturatus,* concolorous male and female, color phase no. 1.

Specimens of the concolorous phase (#1) (Fig. 5 & 6) were of a light yellow to straw color except for a blackish pigment in the region of the median and lateral eyes and along the ridge of the posterior median keels of the carapace. Occasionally some of these animals have an extremely faint fuscous condition laterad and anterior to the median eyes but with a clear yellow area immediately surrounding them. In all color phases, the legs contain a reddish pigment laterally at the points of articulation and the terminal one-half of the aculeus is a blackish red.

Specimens of color phase #2 have the same basic yellowish to yellowish brown color. Indefinite fuscous markings are found throughout the trunk dorsum of the adult. Dark pigment in sub-eliptical form encircles the median eyes, extends as a dark band on each side of anterior median furrow to anterior margin of carapace and is lightly diffused throughout the carapace with a greater concentration along

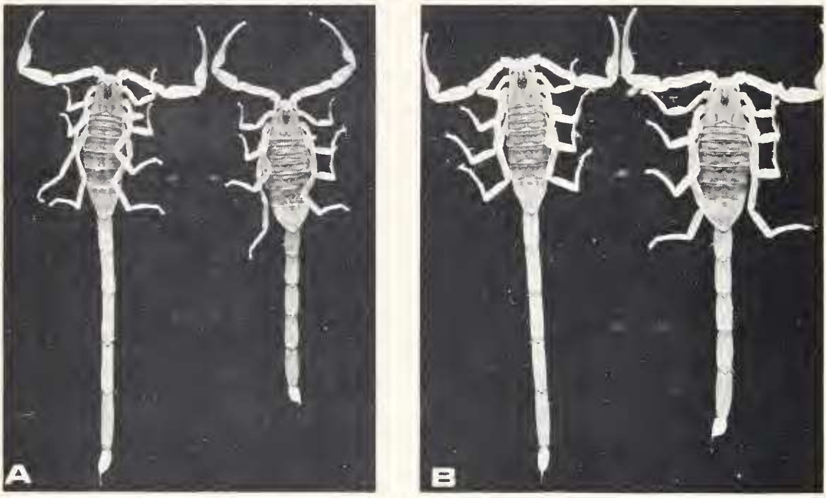


FIG. 7. *C. sculpturatus,* color patterns. Fig. 7A, phase no. 2; Fig. 7B, phase no. 3.

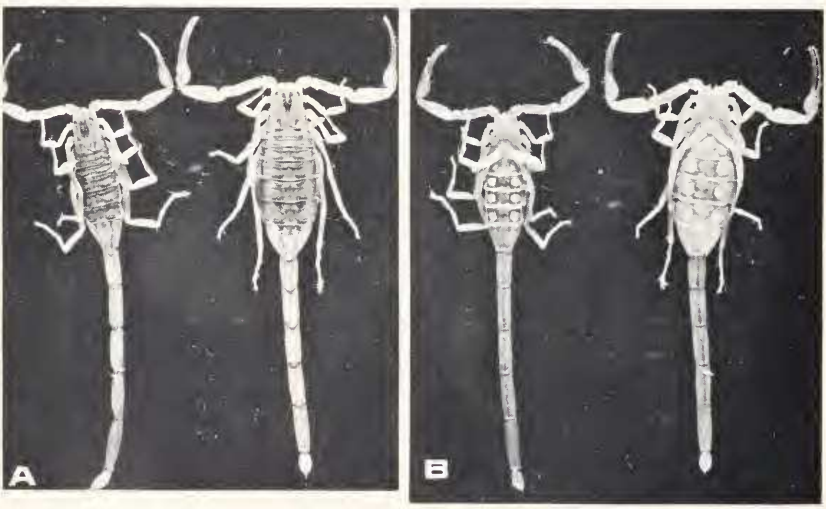


FIG. 8. *C. sculpturatus,* phase no. 4. Fig. 8A, dorsal; Fig. 8B, ventral.

lateral margins (Fig. 7). On the second instar the pre-abdominal markings are more distinct but lacking on the carapace (Fig. 5). Very faint fuscous marbling is present on the pedipalps and lateral surfaces of the legs. The ventral, median caudal area contains a very faint fuscous band. The dorsal aspects of the cheliceral manus have an indefinite fuscous reticulum.

Color phase #3 (Fig. 5 & 7) individuals have the same basic coloration but a definite modification of the fuscous pattern exists. The fuscous reticulum on the dorsum of the cheliceral manus is less distinct but the fuscous markings throughout the trunk are more definite. A distinct subeliptical dark ring surrounds the median eyes. From this two dark bands, one on each side of the anterior median furrow, extend to the anterior carapacial margin. Fuscous bands cover the posterior lateral keels but do not extend anteriorly beyond the median eyes. A fuscous band is also found along the lateral margins of the carapace. Tergites I and II have sub-crescentic, lateral dark spots along posterior margin. On tergites III through VI these spots are oblong and of approximately the same size. The central lateral keels of tergite VII have a small amount of blackish pigment. The fuscous marbling on the lateral aspects of the legs is confined to the femur, patella and trochanter. All the pedipalp segments except the coxa are marbled. The inferior caudal fuscous markings are not as broad on the ♂ as on the ♀. On the latter sex it may extend in an indefinite manner over the entire ventral area of the cauda and lightly invade the lateral areas of segments II through V.

Color phase #4 (Fig. 5 & 8) individuals have the same basic color as individuals of the other phases. The fuscous markings are darker and more definite than on phase 2 and 3 individuals. On the carapace the eyes are again encircled by a sub-eliptical intense fuscous

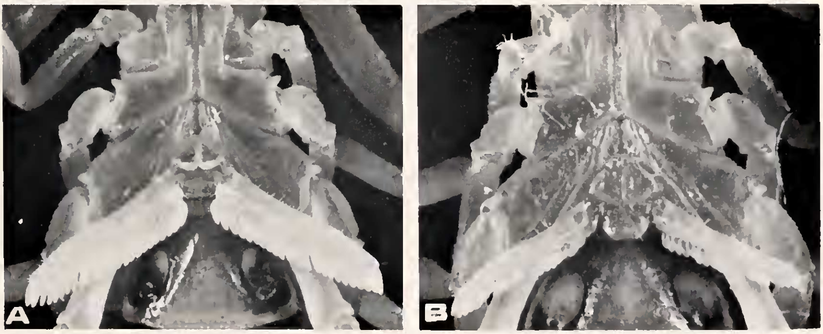


Fig. 9. *C. sculpturatus* male (A) and female (B) genital area. Fig. 9A, pectinal teeth large, begin nearer base of pectine, basal piece short. Fig. 9B, teeth smaller, basal piece posterior margin lobate.

band. The dark pigment reaches the anterior margin on both sides of the anterior median furrow while gradually broadening. Differing from phase 3 the dark pigment extends from the lateral eyes to the posterior margin. It is less intense directly opposite the median eyes and a rather distinct break occurs half-way between the median eyes and the posterior margin. The median furrows are not fuscous. In a rather diffuse manner the melanistic pigment extends laterad and becomes a dark band along the lateral margin. One-half of the posterior margin on each side of the posterior median furrow is densely pigmented. Differing from phases 2 and 3, the tergites all have an intense pigment spot on the pretergite and another covering approximately one-half of the posterior margin on each side of the median keel. Between these two intense spots the fuscous condition is rather diffuse but progressively increases in intensity posteriad. Tergite VII has intense pigment spots on the pretergite and then along the median lateral keels from which it diffusely extends laterad. On all the tergites, the extreme lateral margins are black. On some specimens, the dark pigment also heavily invades the plural membranes. The ventral caudal fuscous markings on both sexes extend to the lateral surfaces. The marbling on the legs and pedipalps is much more distinct than on the other phases. On the legs some marbling is now found also

TABLE 1. Distribution of *C. sculpturatus* by Counties.

Counties	Color Phase									
	Male					Female				
	1	2	3	4	2–3–4	1	2	3	4	2–3–4
Apache	2		1		1	3				
Cochise	4	6	41	10	57	4	13	43	5	61
Coconino	12	10	14	3	27	5	7	11	3	21
Gila	48	2	6	3	11	59	4	11	3	18
Graham	15	7	11		18	33	1	13	1	15
Greenlee	1	2	19	2	23	2	7	31	4	42
Maricopa	212	18	31	3	52	348	35	24	10	69
Mohave	1		2		2	2		3	1	4
Navaho	4	1	6		7	3	1	13		14
Pima	19	2	3		5	32	4	2		6
Pinal	42	2	10		12	50	10	4		14
Santa Cruz	1		5		5	1	3	1		4
Yavapai	24	4	7		11	22	5	3		8
Yuma	5									
	390	54	156	21	231	564	90	159	27	276

on the tibias. The fuscous reticulation of the cheliceral manus dorsum is distinct. Some dark pigment is also found on sternite VII.

Table 1 shows that the distribution of the four color phases is relatively uniform throughout the state with the exception of phase 4. This exception seems to be due to inadequate sampling in these areas and the lower frequency of this phase in the scorpion fauna.

The following morphological description is common to individuals of all color phases.

These scorpions are all strongly granular over-all but are remarkably free of punctations.

The carapace bears three lateral eyes that are subequal in size and arranged in a straight row. The anterior margin bears only a slight indentation which in adults ranges from 0.15 to 0.20 mm. The entire surface is densely covered with minute to moderately large granules. The carapace is sparsely hirsute. The eyes are relatively large and set-off by coarsely granular superciliary crests. The furrows present are all well developed except the weakly developed lateral oculars and the moderately developed posterior laterals. The posterior medians and posterior marginals are the deepest but neither is slit-like. Anterior marginal and transverse medians are lacking with the latter represented in color phase #4 as a clear, moderately agranular swath.

The sternum is sub-triangular with the apex represented as a tiny distinct sclerite. The basal pit is well developed and four macrochaetes are present: Two anteriorly and two posteriorly.

The movable finger of each chelicera is forked with both tines equal in length. Its inferior margin bears two large teeth and numerous long whitish bristles. On the superior margin are four denticles: Number one is about one-half as large as number two; three and four subequal and approximately three times as large as number two. The fixed finger is not forked. On its anterior surface is a large tooth and long whitish bristles that are also found on the inferior manus surface. The superior surface bears two denticles; number one is bicuspid with the anterior cusp generally about one-third larger than the other.

The pedipalp fingers are long and slender, the manus narrow, and the patella and femur are slender.

The pedipalp tarsus is moderately covered with short, somewhat stubby bristles. It has a long, low basal lobe and its cutting edge bears eight non-imbricated, oblique rows of granules plus a short apical row. Each row begins with a large basal granule that is about two to three times as large as the others. The terminal short row bears four to five granules. These median rows are flanked interiorly and exteriorly by large and small granules. The large lateral granules form an oblique row of three with the basal granule of the median oblique rows. Interspersed between the large lateral granules are small ones, the supernumerary granules, which range in number from one to four; the usual number being two to three.

The pedipalp tibial finger is without a basal lobe and contains only a slight indentation to receive the tarsal lobe. The manus of the tibia is sparsely hirsute, densely covered with minute to moderate sized granules in the intercarinal spaces of both sexes. Costate reticulations are absent. All manus keels are moderately to strongly developed and granular. The external marginal keel is strongly developed. The superior exterior secondary is moderately developed. Between these two keels is a short weak but granular accessory keel. The moderately developed superior digital keel extends onto the base of the tibial finger but the equally well developed superior inner secondary keel extends the entire length of this finger with granules on only the basal half.

The keels of the pedipalp patella are moderately to strongly developed and bear moderate sized granules with the exception of the weakly developed ventral inner keel which bears large granules. In addition to the usual keels there is a well developed, granular dorsomedian keel. All the patellar surfaces are densely covered with fine to small granules with the exception of the inner surface. This bears, in addition, scattered large granules and at the proximal margin are usually found two very large dentate granules.

The keels of the pedipalp femur, with the exception of the obsolete exterior median, are all moderately to strongly developed and bear moderate to large sized granules. The exterior surface of the femur is greatly narrowed. All surfaces are densely covered with fine to small granules. In addition to these there are widely dispersed large granules on the exterior surface and a median row of widely spaced large granules, on the inner surface.

The tarsomeres and tibia of the walking legs are moderately to densely covered with short, stout bristles. The other segments are sparsely hirsute. The ventral surfaces of tarsomere II are irregularly covered with moderately long bristles. The patellae of legs I through

IV laterally bear two median granular keels plus superior and inferior strongly granular keels. The intercarinal spaces are densely granular and a row of large granules are found on the inferior margin of the patella and femur. Exterior and interior pedal spurs of all legs are well developed, the exterior one bearing a basal spur and one bristle.

The tergites are sparsely hirsute and are densely covered with fine to moderately large granules. Tergites III-VI each bear a lateral transverse area which is largely devoid of granules. This is most evident on color phase #4. A row of large granules extends along the posterior margin of each tergite which also bear a well developed, granular median keel. Tergite VII generally bears a double row of large granules on the median keel plus two pair of well developed, coarsely granular lateral keels.

The sternites are sparsely hirsute and generally agranular except for lateral dense patches of very minute granules on III-VI and with VII densely covered with fine granules. VII also bears four strongly developed granular lateral keels. The stigmata are elongate and somewhat ovoid.

The genital operculum is considerably smaller on the male but divided on both sexes. The male bears vestigial genital papillae. On both sexes the anterior margin protrudes somewhat more than the posterior margin.

The pectines are sparsely to mildly hirsute. The middle lamellae are irregularly, oblong shaped and vary in number from seven to eleven. The first middle lamella extends a triangular configuration beyond the inner margin and is about one-third as long as the second middle lamella. Of the three marginal lamellae the third is longer than the second and the first is about two to two and one-half times as long as the third. The well developed, subtriangular fulcra generally bear one apical microchaete. The male basal piece is somewhat oblong with the anterior and posterior margins subparallel but the posterior margin of the female basal piece is somewhat lobate (Fig. 9). The basal piece has a slight, central shallow depression but does not have a pit. On the male the pectinal teeth arise closer to the proximal end and are larger than those of the female. The male teeth range in number from 22 to 29, those of the female from 19 to 26 (Table 2). There are approximately six teeth in the area covered by the second marginal lamella on both sexes.

The intercarinal spaces of the metasoma are densely and finely

TABLE 2. Number of pectinal teeth vs color phase of *C. sculpturatus.*

No.	Color Phase									
Teeth	Male					Female				
	1	2	3	4	2–3–4	1	2	3	4	2–3–4
19							1	2		3
20						7	4	14	1	19
21						80	28	34	9	71
22	2	1	7		8	180	30	53	9	92
23	13	6	22	1	29	215	20	41	8	69
24	17	20	53	5	78	67	6	12		18
25	151	16	42	6	64	14	1	3		4
26	101	9	28	8	45	1				
27	36	2	4	1	7					
28	9									
29	1									
N	390	54	156	21	231	564	90	159	27	276
$\bar{X}$	25.24	24.59	24.47	25.14	24.56	22.53	21.96	22.04	21.89	22.0
σ	1.094	1.073	1.15	1.014	1.132	1.008	1.191	1.191	0.899	1.129
3σ	21.96–28.52	21.37–27.8	21.02–27.9	22.10–28.18	21.16–27.95	19.51–25.55	18.68–25.23	18.47–25.61	19.19–24.59	18.61–25.39
CV	4.33	4.36	4.70	4.03	4.61	4.47	5.42	5.40	4.11	5.13

granular but the female granules are somewhat coarser. The caudal segments are sparsely hirsute on both sexes and the telson only moderately so. The dorsal furrow is moderately deep and broad on the first four segments but considerably narrowed on the fifth. The dorsal and superior lateral keels are all well developed and strongly granular approaching a serrate condition. The superior laterals of segment V are obsolete on the ♂, making that segment subcylindrical, but well developed on the ♀. The median lateral keels are well developed and granular on segment I but absent on the other segments. The inferior laterals are well developed and granular on I-IV but V is weakly developed and lightly granular on the male, but strongly developed on female though less granular than I-IV. The inferior median keels are well developed and granular on all segments of the female but on the male they are not as strongly developed or as granular on segments IV and V. The anal arch is weakly to moderately developed with the anterior crest indefinitely granular and the posterior crest agranular on both sexes. The telson of the young bears a subaculear tooth which becomes a small tubercle on the adult. The vesicle of the male is elongate ovoid and inconspicuously granular but

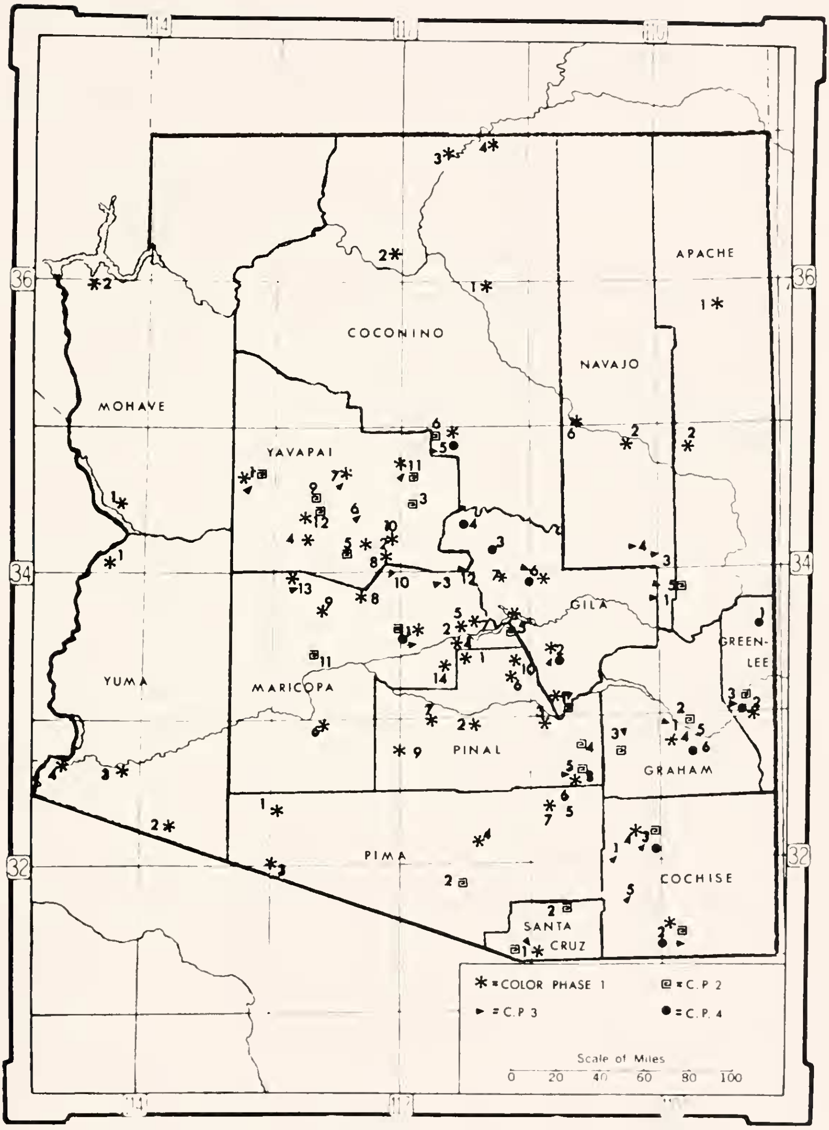


FIG. 10. Arizona distribution of the four color phases of *C. sculpturatus*. See "locality key (elevations in feet in parenthesis): *Apache County*: 1. Ganado (6400); 2. Petrified Forest (5500). *Cochise County*: 1. Benson (3580); 2. Bisbee area (5490); 3. Dragoon (4613); 4. Texas Canyon (5000); 5. Tombstone

not shiny. That of the female approaches more of the globular shape, densely covered with low, moderate sized granules and has a low, granular median keel extending proximad from the tubercle.

Bio-assay and clinical evidence indicate that all color phases have a venom that produces a like syndrome and have a mouse LD_{50} of about 1.12 mg/kg of body weight.

Discussion. The data in Table 2 indicate that all four color phases have about the same range in the number of pectinal teeth. The coefficients of variation range only between 4.03 to 5.42.

The nature of the distribution of all four color phases, as shown in Figure 10, also supports the one species concept. There seems to be no difference in selection by altitude. The range is from 140 ft. at Yuma to over 5000 ft. in the Prescott area and 6000 to 7000 ft. in the central and southern part of the state. The greater populations are found at elevations of 1000-3500 ft. In those localities in which only

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(4539). *Coconino County*: 1. Cameron (4201); 2. Grand Canyon, Phantom Ranch (2500); 3. Marble Canyon (3500); 4. Page (4300); 5. Sedona (4500); 6. Schnebly Hill (6300). *Gila County*: 1. Hayden area (2000); 2. Globe (3500); 3. Payson (4900); 4. Pine (5400); 5. Roosevelt (2200); 6. Sierra Anches (5500); 7. Tonto National Monument (2500). *Graham County*: 1. Ashurst (2700); 2. Fort Thomas (2700); 3. Klondyke (3600); 4. Pima (2800); 5. Thatcher (2900); 6. Safford (2700). *Greenlee County*: 1. Blue (6000); 2. Clifton (3500); 3. Morenci (4700). *Maricopa County*: 1. Phoenix area (1100-1300); 2. Blue Point (1500); 3. Camp Creek (2500); 5. Fort McDowell (1500); 6. Gila Bend (800); 7. Horse Mesa Dam (1400); 8. Lake Pleasant (2000); 9. Morristown (2000); 10. New River (2000); 11. Palo Verde (700); 12. Sunflower (3300); 13. Wickenburg (2900); 14. Williams AFB (1300). *Mohave County*: 1. Lake Havasu City (450); 2. Lake Mead (1200). *Navajo County*: 1. Fort Apache (5600); 2. Holbrook (5100); 3. Lakeside (7000); 4. Showlow (6300); 5. Whiteriver (5200); 6. Winslow (4900). *Pima County*: 1. Ajo (1800); 2. Baboquivari Mountains (5000); 3. Lukeville (1800); 4. Robles Hill (2400); 5. Sabino Basin (3000); 6. Santa Catalina Mountains (7000); 7. Tucson (2400). *Pinal County*: 1. Superstition Mountains (2200); 2. Coolidge area (1400); 3. Kearny (2500); 4. Mammoth (2300); 5. Oracle (4500); 6. Ray (2000); 7. Sacaton (1300); 8. San Manuel (3500); 9. Stanfield (1300); 10. Superior (2800). *Santa Cruz County*: 1. Nogales area (3800); 2. Santa Rita Mountains (5000). *Yavapai County*: 1. Bagdad (4100); 2. Bumblebee (2500); 3. Camp Verde (3100); 4. Congress Junction (3000); 5. Crown King (6000); 6. Mayer (4300); 7. Prescott area (5300); 8. Rock Springs (4000); 9. Skull Valley (4100); 10. Sunset Point (3800); 11. Verde River (3100); 12. Yarnell (4800). *Yuma County*: 1. Parker (400); 2. Tule Mountains (Cabeza Prieta-c 1200); 3. Welton (260); 4. Yuma (140).

phase #1 is indicated, the apparent isolation is more one of inadequate sampling than actual. This is illustrated by the fact that after Fig. 10 had been prepared several specimens of color phase #2 were received from the Yuma area. The same seems to be true about color phase #4.

Thus the pectinal tooth data, the distributional pattern and the fact of hybridization strengthen the weak indications of a one species concept presented by serology and electrophoresis.

Table 3A, 3B and 4 present data taken from measurements of over fifty characteristics. The correlations between female:female and male:male of the four color phases range from 0.98-0.99; between male:female the correlation is 0.90. In Table 4 the items marked with an asterisk indicate sexual dimorphism. In most cases these differences are not as extreme as found in other scorpion taxa. For example, in some species of the genus *Heterometrus* (Scorpionidae) the correlation between opposite sexes is in the range of 0.40-0.60. In the case of *C. sculpturatus* the relative differences in caudal segment lengths gives the impression of extreme sexual dimorphism.

Conclusion. The available evidence indicates that *C. gertschi* must be considered as a synonym for *C. sculpturatus* and that *C. sculpturatus* is to be recognized as a species ranging from a primarily concolorous condition to three color phases bearing varying intensities of fuscous stripes along the trunk dorsum, on the ventral surface of the caudal segments and some fuscous marbling on the lateral surface of the legs. All the evidence is unfavorable for recognizing subspecies taxa.

In Arizona, the knowledge that there is only one "lethal scorpion species" in various color phases will be of considerable medical importance. Now both the layman and physician can recognize (in Arizona) the lethal scorpion by the combination of a very slender structure and a slight protuberance at the base of the stinger. This, together with the fact that they all produce pronounced hyperesthesia at the site of the sting will greatly help in identification and diagnosis.

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Table 3A. Measurements in millimeters *C. sculpturatus* females (plesiotypes).

		Color Phases							
		1	1	1	1	2	3	4	4
Code		665	624	626	632	633	635	639	638
Nos.	Reg. number Locality	Marble Canyon	Tempe	Tempe	Tempe	Tempe	Tempe	Prescott	Tempe
1.0	Total L.	55.34	48.67	51.34	54.69	48.57	53.81	52.02	55.47
2.0	Trunk L.	22.55	20.09	21.47	22.39	19.78	22.15	21.06	22.66
3.0	Metasoma L.	32.72	28.58	29.87	32.30	28.79	31.66	30.96	32.81
4.0	Carapace L.	5.60	5.13	5.33	5.69	4.93	5.60	5.27	5.80
4.1	" Anterior W.	3.03	2.64	2.80	2.84	2.63	2.97	2.80	3.15
4.2	" Median W.	4.55	4.15	4.25	4.40	4.10	4.55	4.25	4.55
4.3	" Posterior W.	5.93	5.53	5.60	5.80	5.33	5.93	5.60	5.87
4.5	" Ant. Marg. to Med. eyes	1.96	1.80	1.83	1.97	1.67	1.93	1.80	2.00
4.9	Diam. Med. Ocul. tubercle	1.07	1.00	1.00	1.00	0.93	1.07	1.00	1.03
4.10	Diam. Med. eyes	0.47	0.37	0.40	0.40	0.37	0.44	0.43	0.40
4.11	Med. eyes to post. margin	3.64	3.30	3.48	3.72	3.26	3.67	3.47	3.80
6.1	Pedipalp L.	21.50	18.80	19.64	21.07	18.52	20.10	19.97	21.44
6.2	Tibia L.	9.50	8.30	8.90	9.60	8.20	8.90	8.90	10.00
6.3	Manus L.	2.83	2.53	2.67	2.80	2.50	2.87	2.73	3.03
6.4	" W.	1.80	1.77	1.87	1.87	1.77	1.97	1.70	1.97
6.5	" D.	1.73	1.60	1.70	1.73	1.67	1.87	1.67	1.83
6.51	Exterior surface L.	2.93	2.67	2.90	2.93	2.67	3.03	2.90	3.10
6.6	Tarsus L.	7.20	6.13	6.60	6.80	6.13	6.70	6.70	7.30
6.7	Patella L.	6.27	5.60	5.67	6.00	5.47	5.87	5.87	6.07
6.8	" W.	1.87	1.80	1.80	2.00	1.80	1.80	1.83	2.00
6.9	Femur L.	5.73	4.90	5.07	5.47	4.85	5.33	5.20	5.47
6.10	" W.	1.37	1.35	1.40	1.40	1.30	1.43	1.33	1.40

TABLE 3A (continued)

6.12	Leg IV Coxa L.	6.80	5.93	6.27	6.47	5.93	6.60	6.33	6.67
6.14	" " Femur L.	5.93	4.95	5.13	5.47	5.00	5.47	5.47	5.87
6.15	" " " W.	1.13	1.07	1.10	1.13	1.05	1.13	1.10	1.13
6.16	" " Patella L.	5.27	4.15	4.35	4.85	4.35	4.80	4.70	4.93
6.17	" " " W.	1.13	1.10	1.15	1.17	1.13	1.23	1.10	1.20
7.0	Mesosoma L.	16.95	14.96	16.14	16.70	14.85	16.55	16.86	16.86
7.1	No. Pectine teeth	25	23	24	25	23	21	22	22
7.21	Pectine L.	5.13	4.00	4.00	4.45	4.10	4.20	4.65	4.65
7.22	Pectine Dentate L.	4.87	3.60	3.70	4.05	3.55	3.75	4.25	4.25
7.3	Terminal tooth L.	0.57	0.50	0.53	0.50	0.53	0.53	0.55	0.55
7.6	Basal piece L.	0.87	0.70	0.77	0.87	0.77	0.90	0.87	0.87
7.7	" " W.	1.40	1.30	1.33	1.37	1.23	1.50	1.37	1.37
7.8	Genital plate L.	1.03	0.93	1.00	1.10	0.97	1.10	1.10	1.10
7.9	" " W.	1.97	1.67	1.77	1.80	1.70	1.85	1.83	1.83
8.1	Metasoma seg. I L.	4.40	3.85	4.00	4.30	3.84	4.25	4.45	4.45
8.2	" " I W.	2.37	2.35	2.30	2.50	2.30	2.37	2.55	2.55
8.4	Metasoma seg. II L.	5.13	4.45	4.75	5.07	4.50	4.95	5.13	5.13
8.5	" " II W.	2.07	2.10	2.15	2.20	2.10	2.27	2.13	2.13
8.7	" " III L.	5.33	4.70	4.90	5.33	4.65	5.13	5.40	5.40
8.8	" " III W.	2.00	1.97	2.10	2.13	2.05	2.23	2.17	2.17
8.10	" " IV L.	5.73	5.00	5.27	5.73	5.13	5.60	5.80	5.80
8.11	" " IV W.	1.93	1.95	2.00	2.07	1.93	2.13	2.07	2.07
8.13	" " V L.	6.80	5.73	6.00	6.67	5.87	6.53	6.70	6.70
8.14	" " V W.	2.00	1.90	1.85	2.00	1.93	2.10	2.00	2.00
8.15	" " V D.	2.03	1.90	1.84	2.07	2.00	2.13	2.07	2.07
8.16	Telson L.	5.33	4.85	4.95	5.20	4.80	5.20	5.33	5.33
8.17	Vesicle L.	3.00	2.80	2.95	3.13	2.55	2.93	3.07	3.07
8.18	" W.	1.75	1.67	1.65	1.70	1.57	1.73	1.70	1.70
8.19	" D.	1.87	1.70	1.75	1.80	1.63	1.83	1.80	1.80
8.20	Aculeus L.	2.60	2.25	2.30	2.30	2.13	2.57	2.50	2.50

TABLE 3B. Measurements in millimeters *C. sculpturatus* males (plesiotypes).

Code		Color Phases					
		1	1	1	2	3	4
Nos.	Reg. number	170.3	187.1	631	634	636	637
	Locality	Mesa	Mesa	Tempe	Tempe	Tempe	Tempe
1:0	Total L.	53.48	58.02	68.86	63.74	58.89	55.69
2.0	Trunk L.	18.61	20.59	24.08	22.23	20.93	19.88
3.0	Metasoma L.	34.87	37.43	44.78	41.51	37.96	35.81
4.0	Carapace L.	4.90	5.20	5.84	5.36	5.13	5.00
4.1	" Anterior W.	2.47	2.47	3.00	2.77	2.53	2.47
4.2	" Median W.	36.0	3.88	4.55	4.10	3.95	3.76
4.3	" Posterior W.	4.70	5.00	5.80	5.20	5.27	4.90
4.5	" Ant. Marg. to Med. eyes	1.67	1.80	1.96	1.76	1.65	1.57
4.9	Diam. Med. Ocul. tubercle	0.93	0.97	1.03	1.00	1.03	0.93
4.10	Diam. Med. eyes	0.30	0.36	0.40	0.43	0.43	0.40
4.11	Med. eyes to post, margin	3.20	3.40	3.88	3.60	3.48	3.30
6.1	Pedipalp L.	19.23	20.37	22.80	21.37	19.64	18.94
6.2	Tibia L.	8.20	8.90	9.70	9.10	8.50	8.40
6.3	Manus L.	2.73	2.90	3.20	3.10	2.90	2.90
6.4	" W.	1.77	1.87	2.20	1.93	1.87	1.70
6.5	" D.	1.73	1.80	2.12	1.87	1.80	1.67
6.51	Exterior surface L.	2.83	3.20	3.44	3.30	2.97	2.87
6.6	Tarsus L.	6.20	6.40	6.75	6.47	6.07	5.73
6.7	Patella L.	5.73	6.07	6.90	6.60	5.87	5.47
6.8	" W.	1.65	1.40	2.10	1.83	1.73	1.67
6.9	Femur L.	5.00	5.40	6.20	5.67	5.27	5.07
6.10	" W.	1.23	1.27	1.40	1.27	1.20	1.23
6.12	Leg IV Coxa L.	5.47	5.93	6.70	6.07	5.73	5.67

Table 3B (continued)

6.14	" " Femur L.	5.00	5.20	5.87	5.40	5.27	5.07
6.15	" " " W.	0.90	1.00	1.13	1.00	0.97	0.93
6.16	" " Patella L.	4.10	4.67	5.07	4.87	4.47	4.20
6.17	" " " W.	0.95	1.00	1.13	1.00	1.07	1.00
7.0	Mesosoma L.	13.71	15.39	18.24	16.87	15.80	14.40
7.1	No. Pectine teeth	26	28	25	25	25	25
7.21	Pectine L.	4.65	5.00	5.40	4.70	4.55	4.55
7.22	Pectine dentate L.	4.50	4.85	5.13	4.40	4.25	4.40
7.3	Terminal tooth L.	0.60	0.67	0.73	0.67	0.63	0.63
7.6	Basal piece L.	0.57	0.63	0.73	0.70	0.67	0.53
7.7	" " W.	1.13	1.23	1.33	1.20	1.20	1.10
7.8	Genital plate L.	0.73	0.77	0.83	0.80	0.80	0.73
7.9	" " W.	1.30	1.37	1.50	1.43	1.40	1.23
8.1	Metasoma seg. I L.	4.80	5.13	6.13	5.47	5.13	5.00
8.2	" " I W.	1.90	2.20	2.40	2.07	2.10	2.05
8.4	Metasoma seg. II L.	5.60	6.07	7.25	6.67	6.13	5.87
8.5	" " II W.	1.67	1.87	2.10	1.87	1.80	1.87
8.7	" " III L.	6.00	6.40	7.60	7.10	6.53	6.20
8.8	" " III W.	1.67	1.80	2.10	1.87	1.77	1.77
8.10	" " IV L.	6.47	6.90	8.40	7.90	7.10	6.67
8.11	" " IV W.	1.67	1.73	2.00	1.80	1.77	1.76
8.13	" " V. L.	7.20	7.80	9.40	8.80	7.80	7.00
8.14	" " V W.	1.77	1.87	2.10	1.90	1.87	1.80
8.15	" " V D.	1.77	1.84	2.13	1.93	1.83	1.83
8.16	Telson L.	4.80	5.13	6.00	5.67	5.27	5.07
8.17	Vesicle L.	3.15	3.53	4.07	3.87	3.68	3.53
8.18	" W.	1.40	1.53	1.80	1.73	1.53	1.53
8.19	" D.	1.65	1.80	1.97	1.70	1.57	1.80
8.20	Aculeus L.	1.93	1.87	2.10	2.07	1.90	1.90

Table 4. *C. sculpturatus*, ratios.

Code Nos.		Females Color Phases								Males Color Phases					
		1	1	1	1	2	3	3	4	1	1	1	2	3	4
		665	624	626	632	633	635	639	638	170.3	187.1	631	634	636	637
3.00/2.00	°	1.45	1.42	1.39	1.44	1.46	1.43	1.47	1.45	1.87	1.82	1.86	1.87	1.81	1.80
3.00/4.00	°	5.84	5.57	5.60	5.68	5.84	5.65	5.87	5.66	7.12	7.20	7.67	7.74	7.40	7.16
3.00/6.1	°	1.60	1.52	1.52	1.53	1.55	1.58	1.55	1.53	1.81	1.84	1.96	1.94	1.93	1.89
4.0/4.1		1.85	1.94	1.90	2.00	1.87	1.89	1.88	1.84	1.98	2.11	1.95	1.94	2.03	2.02
4.0/4.2	°	1.23	1.24	1.25	1.29	1.20	1.23	1.24	1.27	1.36	1.34	1.27	1.31	1.30	1.33
4.0/4.3		0.94	0.93	0.95	0.98	0.92	0.94	0.94	0.99	1.04	1.04	1.00	1.03	0.97	1.02
4.0/6.2		0.59	0.62	0.60	0.59	0.60	0.63	0.59	0.58	0.58	0.58	0.60	0.59	0.60	0.60
4.0/6.51	°	1.91	1.92	1.84	1.94	1.84	1.85	1.82	1.87	1.73	1.63	1.70	1.62	1.73	1.74
4.0/6.6		0.77	0.84	0.81	0.84	0.80	0.84	0.79	0.79	0.79	0.81	0.87	0.83	0.85	0.87
4.0/6.7		0.89	0.91	0.94	0.95	0.90	0.95	0.90	0.96	0.86	0.86	0.85	0.81	0.87	0.91
4.0/6.9		0.98	1.05	1.05	1.04	1.02	1.05	1.01	1.06	0.98	0.96	0.94	0.95	0.97	0.99
4.0/6.12		0.82	0.87	0.85	0.88	0.86	0.85	0.83	0.87	0.90	0.88	0.87	0.84	0.90	0.88
(8.1+8.4)/4.0	°	0.59	0.62	0.61	0.61	0.59	0.61	0.58	0.61	0.47	0.46	0.44	0.44	0.46	0.46
(8.7+8.10)/4.0	°	0.50	0.53	0.52	0.51	0.50	0.52	0.49	0.52	0.39	0.39	0.37	0.35	0.38	0.39
(8.10+8.13)/4.0	°	0.45	0.48	0.47	0.46	0.45	0.46	0.44	0.46	0.36	0.35	0.33	0.32	0.34	0.37
4.0/8.13	°	0.83	0.89	0.89	0.85	0.84	0.86	0.81	0.87	0.68	0.67	0.62	0.61	0.66	0.71
4.2/4.9		4.25	4.15	4.38	4.40	4.41	4.25	4.25	4.42	3.87	4.00	4.42	4.10	3.84	4.04
4.3/4.1		1.96	2.09	2.00	2.04	2.03	2.00	2.00	1.86	1.90	2.02	1.93	1.88	2.08	1.98
(4.3–4.1)/4.0		0.52	0.56	0.53	0.52	0.57	0.53	0.53	0.47	0.45	0.49	0.48	0.45	0.53	0.49
4.4/4.5		1.04	1.00	1.04	1.02	1.02	1.04	1.06	1.12	1.00	1.00	1.07	1.04	1.05	1.10

TABLE 4 (continued)

4.5/4.0		0.35	0.35	0.34	0.35	0.34	0.36	0.34	0.34	0.34	0.35	0.34	0.33	0.34	0.31
4.5/4.11		0.54	0.55	0.53	0.53	0.51	0.54	0.52	0.53	0.52	0.53	0.51	0.51	0.50	0.48
4.9/4.10		2.28	2.70	2.50	2.50	2.51	2.43	2.33	2.58	3.10	2.69	2.40	2.56	2.40	2.33
4.11/4.0		0.65	0.64	0.65	0.65	0.66	0.66	0.66	0.66	0.65	0.65	0.66	0.67	0.68	0.66
6.2/6.3	°	3.36	3.28	3.33	3.43	3.28	3.10	3.26	3.30	3.00	3.07	2.88	2.94	2.93	2.90
6.2/6.4		5.28	4.69	4.76	5.13	4.63	4.52	5.24	5.08	4.63	4.76	4.41	4.55	4.55	4.94
6.2/6.6		1.32	1.35	1.35	1.41	1.34	1.33	1.33	1.37	1.32	1.39	1.44	1.41	1.40	1.47
6.2/6.9		1.66	1.69	1.76	1.76	1.69	1.67	1.71	1.83	1.64	1.65	1.56	1.60	1.61	1.66
6.3/6.6		0.39	0.41	0.40	0.41	0.41	0.43	0.41	0.42	0.44	0.45	0.47	0.48	0.48	0.51
6.4/4.0		0.32	0.35	0.35	0.33	0.36	0.35	0.32	0.34	0.36	0.36	0.38	0.37	0.36	0.34
6.4/6.3		0.64	0.70	0.70	0.67	0.71	0.69	0.62	0.65	0.65	0.64	0.69	0.65	0.64	0.58
6.4/6.5		1.04	1.10	1.10	1.08	1.06	1.05	1.02	1.08	1.02	1.04	1.04	1.07	1.04	1.02
6.4/6.7		0.29	0.32	0.33	0.31	0.32	0.34	0.29	0.32	0.31	0.31	0.32	0.30	0.32	0.31
6.4/6.9		0.31	0.36	0.37	0.34	0.36	0.37	0.33	0.36	0.35	0.35	0.35	0.35	0.35	0.34
6.51/6.4		1.63	1.51	1.55	1.57	1.51	1.54	1.71	1.57	1.74	1.71	1.56	1.65	1.59	1.69
6.51/6.5		1.69	1.67	1.71	1.69	1.60	1.62	1.74	1.69	1.66	1.78	1.62	1.76	1.65	1.72
6.51/6.6		0.41	0.44	0.44	0.43	0.44	0.45	0.43	0.42	0.46	0.50	0.51	0.51	0.49	0.50
6.51/6.7		0.47	0.48	0.51	0.49	0.49	0.52	0.49	0.51	0.49	0.50	0.50	0.50	0.51	0.52
6.6/6.4	°	4.00	3.46	3.53	3.64	3.46	3.40	3.94	3.71	3.50	3.42	3.07	3.24	3.25	3.37
6.7/6.9		1.09	1.14	1.12	1.10	1.13	1.10	1.13	1.11	1.15	1.12	1.11	1.16	1.11	1.08
6.9/6.10		4.18	3.63	3.62	3.91	3.73	3.73	3.91	3.91	4.07	4.25	4.43	4.46	4.39	4.12
6.12/7.21	°	1.33	1.48	1.57	1.42	1.45	1.57	1.42	1.45	1.18	1.19	1.21	1.29	1.26	1.22
6.16/6.14		0.89	0.84	0.85	0.89	0.87	0.88	0.86	0.84	0.82	0.90	0.86	0.90	0.85	0.83
7.21/7.22		1.05	1.11	1.08	1.10	1.15	1.12	1.10	1.11	1.03	1.03	1.05	1.07	1.07	1.03
7.21/7.3		9.00	8.00	7.55	8.90	7.74	7.92	8.90	8.55	7.75	7.46	7.40	7.01	7.22	7.22
7.21/7.9	°	2.60	2.31	2.26	2.53	2.41	2.33	2.34	2.54	3.58	3.65	3.60	3.36	3.25	3.70
7.6/7.7		0.62	0.54	0.58	0.59	0.63	0.60	0.64	0.64	0.50	0.51	0.55	0.64	0.56	0.45
7.6/7.8		0.84	0.75	0.77	0.79	0.79	0.82	0.84	0.79	0.78	0.82	0.88	0.88	0.84	0.73

Table 4 (continued)

Code Nos.		Females Color Phases								Males Color Phases					
		1	1	1	1	2	3	3	4	1	1	1	2	3	4
		665	624	626	632	633	635	639	638	170.3	187.1	631	634	636	637
7.7/7.9	*	0.71	0.75	0.75	0.82	0.72	0.81	0.74	0.76	0.87	0.90	0.89	0.84	0.86	0.89
7.9/7.8		1.91	1.80	1.77	1.64	1.75	1.68	1.78	1.64	1.78	1.78	1.81	1.75	1.75	1.68
8.1/8.2	*	1.86	1.64	1.74	1.72	1.67	1.79	1.80	1.75	2.53	2.33	2.55	2.64	2.44	2.44
8.1/8.4		0.86	0.86	0.84	0.85	0.85	0.86	0.86	0.87	0.86	0.85	0.85	0.82	0.84	0.85
8.2/8.14		1.19	1.24	1.24	1.25	1.19	1.13	1.18	1.28	1.07	1.18	1.14	1.09	1.12	1.14
8.4/8.5	*	2.48	2.10	2.20	2.30	2.14	2.18	2.45	2.40	3.35	3.25	3.45	3.57	3.41	3.14
8.7/8.8	*	2.67	2.39	2.33	2.50	2.27	2.30	2.70	2.49	3.59	3.56	3.62	3.80	3.69	3.50
8.10/8.11	*	2.97	2.56	2.64	2.77	2.66	2.63	2.91	2.80	3.87	3.99	4.20	4.39	4.01	3.79
8.13/8.14	*	3.40	3.02	3.24	3.34	3.04	3.07	3.31	3.35	4.07	4.17	4.48	4.63	4.17	3.89
8.13/8.16	*	1.28	1.18	1.21	1.28	1.22	1.26	1.36	1.26	1.50	1.52	1.57	1.55	1.48	1.43
8.14/6.6		0.28	0.31	0.28	0.29	0.31	0.31	0.29	0.27	0.29	0.29	0.31	0.29	0.31	0.31
8.16/6.2		0.56	0.58	0.56	0.57	0.59	0.58	0.54	0.53	0.58	0.58	0.65	0.62	0.62	0.60
8.17/8.18	*	1.71	1.68	1.79	1.84	1.62	1.69	1.81	1.81	2.25	2.31	2.26	2.24	2.41	2.31
8.17/8.19	*	1.60	1.65	1.69	1.74	1.56	1.60	1.73	1.71	1.90	1.96	2.07	2.28	2.34	1.96
8.18/8.8		0.88	0.85	0.79	0.78	0.77	0.78	0.86	0.80	0.84	0.85	0.86	1.01	0.86	0.86
8.18/8.14		0.88	0.88	0.89	0.84	0.81	0.82	0.86	0.85	0.79	0.81	0.86	0.91	0.82	0.92
8.18/8.19		0.94	0.98	0.94	0.93	0.96	0.95	0.94	0.94	0.85	0.85	0.91	1.02	0.97	0.85

Museum of Natural History, the California Academy of Sciences and the United States National Museum.

Material used: ARIZONA. *Apache Co.*, Ganado (Dr. Pinkerton); Painted Desert (Vera Schaffer); Petrified Forest (Milford Waite). *Cochise Co.*, Benson (H. L. Stahnke, Wm. Stoffers); Bisbee (L. T. Buell, F. Bullard, Ida Corrin, Edith James, Laurence Reilly); Dragoon (F. F. Baker, O. Guiterus, S. M. Long, Moseley, Wm. Shussler, W. L., G. H., R. and B. Stoffers); Texas Canyon (H. L. Stahnke); Tombstone (J. V. Eberte); Warren (C. Allen, J. W. Keim, J. R. Sharp, M. Yuncevich). *Coconino Co.*, Cameron (W. Griffin); Grand Canyon (H. L. Stahnke, James McCleary, P. H. Poquett, Ed Ralph); Marble Canyon (H. L. Stahnke, Perry Thompson, Curt and Kathy Mossestad); Oak Creek Canyon (R. C. Kremer, L. Lyons); Page (S. C. Jones); Sedona (D. Bladon, W. G. Dick, David H. Dickenson, C. Dillon, M. Funderberg, M. P. Nichols, J. F. Potts, J. D. Riner, H. Rodgers, Dr. Leo Schnur, K. A. Snow, H. Sundman); Schnebly Hill Vista (T. Lutz). *Gila Co.*, Christmas (C. E. Kemp); Christmas Mines (J. Eastlick); Globe (M. Anthony, Chamber of Commerce, R. Coy, R. F. Dempster, L. A. Gartellum, Globe High School, D. Gordon, Earl Jackson, C. Jacobson, P. Kennedy, L. Leward, Lions Club, T. J. Melton, G. Oakes, J. Provencio, A. Sanders, J. L. Shiner, T. W. Spoeri, T. Tanaba, C. E. Thoen, V. Valkenburgh, G. Vantilberg, L. Williams); Hayden (J. R. Anderson, H. H. Bollinger, Leo Fanning, N. C. Grissom, K. Larmon, B. Westfall); Miami (S. L. Brown, I. Marshall, B. McMillan); Payson (C. Kimaru, N. Matthews, J. Shippard, J. Strong); Pine (E. Fuller); Roosevelt (W. Bromberg, R. Dickerman, Hazel Gilbert, W. R. Oakes, J. Peavy, B. Satran, M. Wilson); Salt River (G. Hawkins); Salt River Canyon (B. Plant); Sierra Anches (C. Montgomery, T. Templeton, Ranger Station); Tonto National Monument (W. Bromberg, J. Peavy, T. R. Thompson); Winkelman (J. T. Eastlick, C. E. Kemp, J. H. Larman, R. Siville). *Graham Co.*, Ashurst (N. Anderson, L. Bryce, H. L. Hubbard); Fort Thomas (L. Bryce, M. Hinton, E. Hopkins, S. Shirley); Klondyke (T. Harrington); Pima (A. E. Bryce, O. Patterson); Safford (A. Montierth, O. J. Moore, R. F. Robinson, Safford Inn); Thatcher (N. Goodman). *Greenlee Co.*, Blue (T. Lutz); Clifton (C. Davis, C. B. Fliming, Jr., Evelyn Gill, H. H. Gilliland, F. Hernandez, G. Sherrl, E. Stuckey); Morenci (A. Foote, J. S. Forte, H. Kenneth, D. J. Mitchell, L. Ormsby, B. Patton, H. L. Stahnke, E. Stuckey, L. Tomlin, F. Windler, J. W. Crawford). *Maricopa Co.*, Arlington (Wm. McElhanon, Dr. Roney); Bartlett Dam (B. Chenny); Blue Point (E. Richardson); Buckeye (H. Hooper, J. B. Langdon, G. Severy, L. Welch); Camp Creek (R. P. Murlless); Canyon Lake (T. Lutz); Carefree (T. Lutz, C. Thompson); Cave Creek (R. Clark, M. J. Hewitt, B. Johnson, E. G. Nelson, S. A. Sherrod); Chandler (T. C. Kraver); Coons Bluff (T. Lutz); Ft. McDowell (S. A. Sherrod, G. Willis); Gila Bend (H. L. Stahnke); Glendale (N. Gale, A. Nicolett, V. Nicolet, J. Wilson); Goodyear (G. Laner); Higley (R. Vest); Horse Mesa Dam (G. Nicholls); Kyrene (L. E. Redden); Lake Pleasant (D. Price, W. VanLandingham); Laveen (A. Cheatham, R. L. Harshman, R. Leeds, C. Leonard, G. W. Wintz, V. Wintz); Lehi (R. Lopez, E. Pena); Mesa (P. Alkire, P. Allen, Kay Anderson, E. J. Barton, R. Bodkin, D. J. Bracki, Capps, J. Crum, J. S. Decker, V. Dees, E. DeSpain, H. L. Ellsworth, D.

Emmett, R. Erhardt, T. Favero, G. Franklin, B. D. Gilpin, C. Hamm, L. Hammon, D. Harrell, F. English, G. Johnson, P. Johnson, M. Jones, M. Knudson, M. Langford, R. Lopez, E. Martin, M. Miller, R. Miller, N. Miranda, L. Pearce, J. Pew, N. Pina, D. Pomeroy, C. Porter, D. Russell, K. Serrine, K. Sheppard, G. Smith, L. Smith, H. L. Stahnke, J. L. Stahnke, P. Strohmeyer, B. Titjen, M. Watson, P. Weldon, C. Whittle, J. Wisherd, I. Young); Morristown (H. J. Fish); New River (M. Richard); Palo Verde (F. Bruner); Phoenix (M. Arvallol, J. Austin, J. A. Baker, W. C. Bayham, R. Burgess, C. Carvajal, L. Chamberlain, Cole, J. Fortenberry, W. M. Gentry, R. Hand, R. Jennings, F. Johnston, W. V. Kelly, M. Krofitch, K. Larman, T. Lutz, M. McDonald, McKibbon, D. P. Milovich, K. Mohler, D. Moser, A. Rasor, G. Rimmer, I. Sapien, H. L. Stahnke, J. Stovall, L. Vance); Pinnacle Peak (B. Miller, R. Porter); Scottsdale (O. J. Clarke); Seven Springs (Cole, T. Lutz, W. J. Raithel, J. Strong); Sunflower (A. Palmer); Tempe (H. B. Aceve, Dr. B. Boelter, B. Chaffery, J. W. Ellertson, R. Farr, C. Fleming, Jr., Hanson, C. Kettering, D. Kipperman, M. Krofehik, R. Lockwood, K. Mortenson, P.A.R.L., F. Province, V. Richardson, J. Sackey, P. J. Scheier, Dr. Scherr, P. Schuetz, A. G. Sena, H. L. Stahnke, N. Swartz, J. Watterson, J. Weber, M. Wurts); Tolleson (B. Barton); Wickenburg (O. J. Corbin, B. Hannon, T. McDonald); Williams A.F.B. (A. Joseph). *Mohave Co.*, Lake Havasu City (D. Beltz, J. Finley, R. Morrow); Lake Mead (A. Snyder). *Navajo Co.*, Ft. Apache (H. L. Stahnke); Ft. Apache Reservation (Wm. Iselin); Holbrook (W. B. Cross); Lakeside (C. Webb); Show Low (J. H. Webb); Whiteriver (W. Krokpatrick, Ft. Apache Hospital, Dr. Foster, Gertsch, H. L. Stahnke, D. Russell); Winslow (C. H. Peterson). *Pima* Co., Ajo (C. F. Bohannon, B. Nichols, M. Smith, H. L. Stahnke); Baboquivari Mts. (J. W. Green, H. B. Leech); Esperero Canyon (Bogert); Lukeville (V. L. Jackson); Robles Hill (W. O. Gregg); Sabino Basin (J. Raker); Santa Catalina Mts. (C. Grant); Tucson (T. Kiene, A. Lee, E. M. Payton, A. Petrunkevitch, J. Schwartzmann, P. Steckler). *Pinal Co.*, Apache Junction (J. Mitchell); Casa Grande (B. Casaus, W. H. Johnson, R. C. Wells); Coolidge (R. Carter, N. Dodge); Eloy (D. Elder, F. W. Shedd); Kearny (A. Valencia); Mammoth (M. Verdugo, R. Watson); Oracle (J. G. Aronovici, Quarelli, H. L. Stahnke); Ray (H. Beaker, E. Coffin, T. E. Jacobson, D. Knowlton, H. Valencia, V. Woods); Sacaton (R. H. Peebles); San Manuel (W. Blomquist, S. Burgus); Stanfield (Bonerides); Superior (P. M. Alvrez, W. Alzner, J. C. Edmonds, E. Knighten, Magma Hospital, S. Navarro, H. L. Stahnke, A. Valensvela); Superstition Mts. (J. S. Decker, J. Dwight, H. L. Stahnke, H. Suish); Toltec (T. S. Moose). *Santa Cruz Co.*, Nogales (Brewer, W. Bristol, L. F. Byars, F. J. Dyer, J. W. Haddock, D. R. Johnston, M. L. Mason); Santa Rita Mts. (R. Flock). *Yavapai Co.*, Bagdad (J. L. Coats, H. Dedge, E. DeSpain, Hardenbrook, M. Jones, B. M. Long, E. Ramirez, M. Rincon, J. Schubert, H. L. Stahnke, E. Thon); Bumblebee (W. E. Black, E. V. Tilberg, V. Warren); Camp Verde (A. C. Reed); Congress Junction (J. P. Klein, F. Kuykewdell); Crown King (G. V. Tilberg, V. Warren); Mayer (R. Clayton); Prescott (P. Evans, J. Hudson); Rock Springs (Guilt); Skull Valley (W. Reilly); Spider Ranch (near Prescott) (H. L. Stahnke); Sunset Point (N. Konzal); Verde River (H. Rice, R. Sheedy, H. L. Stahnke); Yarnell (J. M. Kinneman, R. Machey, C. Mackey, W. A. Wehrle).

Yuma Co., Parker (M. G. Rock); Tule Mts. (V. Roth); Wellton (D. A. Curtis); Yuma (M. Ennis.)

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2.0132. Some observations of the genus Centruroides Marx (Buthidae, Scorpionia), and C. sculpturatus Ewing.

Abstract.—The correct generic name for the American scorpions formerly in the genus *Centrurus* is *Centruroides* Marx. The species *Centruroides sculpturatus* Ewing has several color phases in Arizona, one of which has been called *Centruroides gertschi*.—Herbert L. Stahnke, Poisonous Animals Research Laboratory, Arizona State University, Tempe, AZ 85281.

Descriptors: Scorpionida; scorpion; Buthidae; *Centrurus*; *Centruroides*; *Centruroides sculpturatus,* color phases; Arizona; venom.